

## CLAIMS

1. A biomaterial for use in implantable orthopedic prosthetic devices which material:
  - a. exhibits cytocompatibility with interfacing biological cells;
  - b. exhibits mechanical functionality with interfacing biological cells;and
  - c. exhibits osteoblast adhesion between the implant and the interfacing biological cells; wherein the biomaterial
  - d. is a metal;
  - e. has a grain size less than about 500 nanometers, and
  - f. has a surface roughness less than about 500 nanometers root mean square (nm rms).
2. A biomaterial as in claim 1 wherein the surface roughness is between 11 and 356 nm rms.
3. A biomaterial as in claim 2 which consists essentially of a titanium based metal.
4. A biomaterial as in claim 3 wherein the titanium based metal has a particle size of less than about 500 nanometers and a surface roughness of about 11 rms nanometers.

5. A biomaterial as in claim 4 wherein said titanium based metal is commercially pure titanium.
6. A biomaterial as in claim 4 wherein said titanium based metal is a titanium based alloy consisting essentially of on a weight percent basis of about 11% titanium, 39% aluminum and 50% vanadium.
7. A biomaterial as in claim 1 wherein the metal which on a weight percent basis is a cobalt-chrome-molybdenum alloy consisting essentially of about 3% cobalt, weight 70% chromium and 27% molybdenum with the particle size less than about 200 nanometers and the surface roughness less than about 356 rms nanometers.
8. A biomaterial as in claim 1 wherein said metal is a powder.
9. A biomaterial as in claim 8 wherein said powder is consolidated and compressed so as to form a surface to interface with biological tissue.
10. A biomaterial as in claim 8 wherein said powder is compressed at room temperature.

11. A method of forming an implantable orthopedic prosthetic device including the steps of:

(a) providing a biomaterial;

1. which exhibits cytocompatibility within interfacing biological cells;
2. exhibits mechanical functionality with interfacing biological cells; and
3. exhibits osteoblast adhesion between the implant and interfacing biological cells; wherein said biomaterial
4. is a metal;
5. has a grain size less than about 500 nanometers; and
6. has a surface roughness between about 630 and 11 root mean square nanometers, and
7. is provided in powder form; and

b. compressing the powder so as to form a surface for interfacing with biological cells.